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JULY 15.

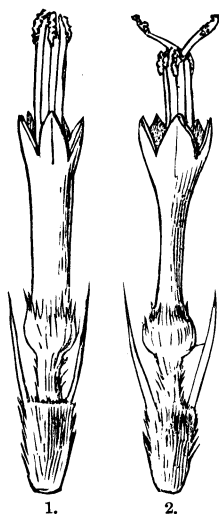
Mr. THOMAS MEEHAN, Vice-President, in the chair.

Fifteen persons present.

A paper entitled "The Geology of Delaware," by F. D. Chester, was presented for publication.

On Elasticity in the Filaments of Helianthus.—Mr. THOMAS MEEHAN remarked that in many composite flowers the pollen is ejected from the apex of the staminal tube, and it became a matter of interest to ascertain the mechanism by which this is accomplished. The flowers of compositæ are much frequented by pollen-collecting insects. Honey-gatherers seldom resort to them. It is difficult on this account to watch the flow of pollen in the open air, as it is collected by the insects as fast as it appears. Some flowers of *Helianthus lenticularis*, Dougl., were gathered, and for

the purpose of study placed in saucers of water in a room where insects could not disturb them. In this way it was observed that after the corolla tube had reached its full length, very early the following morning the staminal tube commenced to grow beyond the mouth of the corolla, and by about 9 A. M. had extended to a distance of about one-fourth the whole length of the corolla. The pollen then commences to emerge through the upper portion of the staminal tube, which, the stamens narrowing, has the apices free. During the day the pollen continues to pour out, till by nightfall a large amount has accumulated at the apex of the tube. A floret at this stage of growth is represented by fig. 1. The morning of the second day the arms of the pistil emerge and commence to expand, and at once the staminal tube begins to descend, exhibiting at the end of the second day the appearance indicated by fig. 2. By the end of the third day, the



staminal tube has retired entirely within the tube of the corolla, and with the pistil, commences to wither. A careful examination shows that through the whole course the column of united anthers remains entirely of the same length. It is the filaments only which are elastic. These stretch fully one-half their length. They are attached to the tube of the corolla at the inflated portion a short distance above the achene, and extend to about midway between this point and the end of the tubular portion at the base of the limb; but when the anther tube is extended as described in fig. 1, the filaments occupy the

whole of this space. This pollen could fall on the stigma of the flower of the previous day, but as the stigma is already covered by pollen of its own, other pollen is hardly likely to be of much service; and even if this outer circle did profit by the pollen of the inner, it would not be cross-fertilization in any legitimate sense of the word. We may say emphatically that the arrangements favor self-fertilization.

An interesting feature is the change in the form of the floret on the second day of expansion. At the point where the stamens are inserted on the corolla, the tube is somewhat inflated and covered by short hair. On the first day this inflated portion is elongated, and the whole tube uniformly cylindrical, as in fig. 1. On the second day the inflation is depressed, and the corolla hypocrateriform as in fig. 2. This is probably owing to the partial withering of the corolla, but it is worth noting as a guide in the study of the florets of compositæ—the normal form is that exhibited before the anthers mature.

The extension of the staminal tube is evidently mechanical, and is due solely to the upward growth of the stigma, which, partly it seems by the incurved points of the stamens, and partly perhaps by the expansion of the arms of the pistil, is able to carry the tube up with it. This force being removed as soon as the arms emerge, the elastic stamens draw the tube down again to its normal location. This portion of the observation was made by Mr. Alois Lunzer, the artist of the *Flowers and Ferns of the United States*, then engaged in making a painting of the flower for that work.

The effect of this process is to render the plant strictly a self-fertilizer. The arms of the pistil are covered with rigid hair having an upward direction. By the pushing upwards of the pistil in its endeavor to escape from the embrace of the stamens, these hairs brush the pollen upwards, and it is in this way that the pollen is forced through the fissures at the apex as already described. When the arms emerge, they are completely covered with own-pollen, which remains till the stigmas mature.

Helianthus lenticularis is the common annual sunflower of the Western plains, and believed by Professor Asa Gray to be the parent of the garden sunflower. This is not in bloom at the present date. One species, *Helianthus hirsutus*, is in bloom, and exhibits similar features, and they are probably characteristic of the whole genus, and perhaps of other composite plants. In *Centaurea* the apex of the anther tube is closely united, and is taken up with the development of the pistil, which finally escapes through a rupture at the side. But in this case there seems to be a cotemporaneous growth of the filaments. At any rate there is no elasticity, and the staminal tube is not drawn back to the tube of the corolla. Pollen is, however, brushed out by the stigmatic hair, and each floret receives own-pollen as in *Helianthus*.

The following was ordered to be printed :—